

# Work Order ID 72813

Tuesday, August 16, 2011 8:00:36 AM



**U/R**

Item ID: D350-748-141TRN

Accept



Setup Start



Revision ID: U/R

Item Name: Crosstube Turning Detail

Stop



Start Date: 8/16/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 8/22/2011 Req'd Qty: 1.00

Customer:

Reference:

Approvals: Process Plan:

Date: 11-08-16 Tooling:

Date:

Run Start



QC:

Date: SPC (Y/N):

Date:

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
D350-748-141	F U R OK QP 11.11.27

100	MORI SEIKI CNC LATHE LARGE	0.00
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Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio FA648  
2-Turn first side as per Folio FA648  
3- File transition lines smooth.

1 Ø  
OFS / 9mm.1 11/08/19

110	QC1- Inspect dimensions to dimension sheet	0.00
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QC

Memo

0.00

Quality Control

9mm.4 OFS 11/08/22 1 Ø

120	MORI SEIKI CNC LATHE LARGE	0.00
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Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Turn second side as per Folio FA648  
2- File transition lines smooth.  
3-Scribe Part & Batch as per Dwg D350-748-141

9mm.4 OFS 11/08/22 1 Ø

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Work Order ID 72813

Tuesday, August 16, 2011 8:00:36 AM

Page 2

Item ID: D350-748-141TRN

Accept

Revision ID: U/R

Item Name: Crosstube Turning Detail

Start Date: 8/16/2011 Start Qty: 1.00

Required Date: 8/22/2011 Req'd Qty: 1.00

Reference:

Cust Item ID:

Customer:

Approvals:

Process Plan:

Date:

Tooling:

Date:

QC:

Date:

SPC (Y/N):

Date:

Run Start

Stop

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Tool ID

Tool #

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

130

QC1- Inspect dimensions to dimension sheet

0.00

QC

Memo

0.00

Quality Control

9mm / OFS 11/08/22 1 0

140

QC8- Inspect parts - second check

0.00

QC

Memo

0.00

Quality Control

B.A 11/08/22

1 0

150

Large Fab

0.00

Crosstubes

Memo

0.00

Crosstubes

Grind machining marks

11-8-23

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries.

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Page 3

**Accept**

[illegible]

**Setup Start**

**Stop**

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**Cust Item ID:**

**Customer:**

**Reference:**

Run Start

**Date:**

**Tooling:**

**Date:**

**Stop**

QC:

Date:

**SPC (Y/N):**

Date:

**Insp.  
Stamp**

0.00

## Memo

0.00

Issue P/O: 14727  
Heat Treat to min 180 KSI As per Dwg D350-748-141  
(MIL-T-6736 OR AMS 2759-1C)  
Sand Blast tube after Heat Treat  
Possible Supplier: Vac Aero  
Ensure Certificate of Conformity is attached

0.00

## Memo

0.00

Ensure certificate of conformaty is attached

0.00

## Memo

0.00

## Quality Control

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

**Work Order ID 72813**

Tuesday, August 16, 2011 8:00:36 AM



Page 4

Item ID: D350-748-141TRN

Accept



Setup Start



Revision ID: U/R

Stop



Item Name: Crosstube Turning Detail

Start Date: 8/16/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 8/22/2011 Req'd Qty: 1.00



Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
190 	Packaging	0.00							
Packaging	Memo	0.00							
Packaging	Identify and stock in kanban rack Location: <u>Back Hall</u>								
		<i>mmc 11/09/29</i>							
200 	QC21- Final Inspection - Work Order Release	0.00							
QC	Memo	0.00							
Quality Control									

*11/9/27*  
*MF*  
*11-09-27*

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



# Picklist Print

Tuesday, August 16, 2011 8:00:42 AM

Page 1

Work Order ID: 72813

Parent Item: D350-748-141TRN

Parent Item Name: Crosstube Turning Detail




Start Date: 8/16/2011

Required Date: 8/22/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 08-03-06 DD verified by:ec  
 IPP Rev B Removed polish 08.04.02 EC verified by : DD  
 IPP Rev C Remove LPS-3 08.06.23 EC verified by DD IPP Rev C  
 11.02.24 as per dwg rev.F DD verf: JLM

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6015-125  Crosstube Material		Manufactured	No			110	Each	30.0000	1	1			

Location

Loc Qty

Loc Code

HALL

30

61380

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MAN.L 11/08/19

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

<b>DART AEROSPACE LTD</b>	<b>Work Order:</b>	72813
<b>Description:</b> Crosstube Assembly (AS350/355 High Fwd)	<b>Part Number:</b>	D350-748-141
<b>Inspection Dwg:</b> D350-748-141 <b>Rev:</b> F		<b>Page 1 of 1</b>

### FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.244"	✓		mic	CNC-04
	2.180	+0.005/-0.000	2.184"	✓		"	
	2.180	+0.005/-0.000	2.184"	✓		"	
	2.237	+0.005/-0.000	2.240"	✓		"	
	2.272	+0.005/-0.000	2.276"	✓		"	
	2.306	+0.005/-0.000	2.308"	✓		"	
	2.339	+0.007/-0.000	2.339"	✓		"	
	2.339	+0.007/-0.000	2.346	✓		"	
	0.062	+/-0.010	.062	✓		vern	JF-01
	4.26	+/-0.030	4.256"	✓		"	
	R0.063	+/-0.010	.063	✓		RG	Ref.
	R0.50	+/-0.030	R.500"	✓		"	
SIDE B	2.240	+0.005/-0.000	2.244"	✓		mic	CNC-04
	2.180	+0.005/-0.000	2.184"	✓		"	
	2.180	+0.005/-0.000	2.185"	✓		"	
	2.237	+0.005/-0.000	2.241"	✓		"	
	2.272	+0.005/-0.000	2.274"	✓		"	
	2.306	+0.005/-0.000	2.309"	✓		"	
	2.339	+0.007/-0.000	2.340"	✓		"	
	2.339	+0.007/-0.000	2.346	✓		"	
	0.062	+/-0.010	.062	✓		vern	JF-01
	4.26	+/-0.030	4.253"	✓		"	
	R0.063	+/-0.010	.063	✓		RG	Ref.
	R0.50	+/-0.030	R0.500"	✓		"	
	110.27	+/-0.060	110.26	✓		terpe	OMM-02

<b>Measured by:</b> M.M. VAB	<b>Audited by:</b> B.A	<b>Preliminary Approval:</b>
<b>Date:</b> 11/08/19	<b>Date:</b> 11/08/22	<b>Date:</b>

Rev	Date	Change	Revised by	Approved
A	06.11.09	New Issue (P/O D350-748-101)	KJ/JLM	
B	07.10.24	Dwg Rev updated	KJ/EC/DD	
C	11.01.20	Dwg Rev updated	KJ	
D	11.07.26	Tolerance revised for 2.339 dimensions	KJ	

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11711

Item	Qty	Part Number	Description
	-141		
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115  
FINISHED LENGTH = 110.270±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 30.45 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.  
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO  
BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-5736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO  
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE,  
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE  
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,  
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.  
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE  
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO  
CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT  
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN  
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

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F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN			
DRAWN			
CHECKED			
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	10.11.23		

<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
DRAWING NO. D350-748-141	REV. F SHEET 1 OF 4
TITLE CROSSTUBE (AS 350/355 HI FWD)	SCALE NTS
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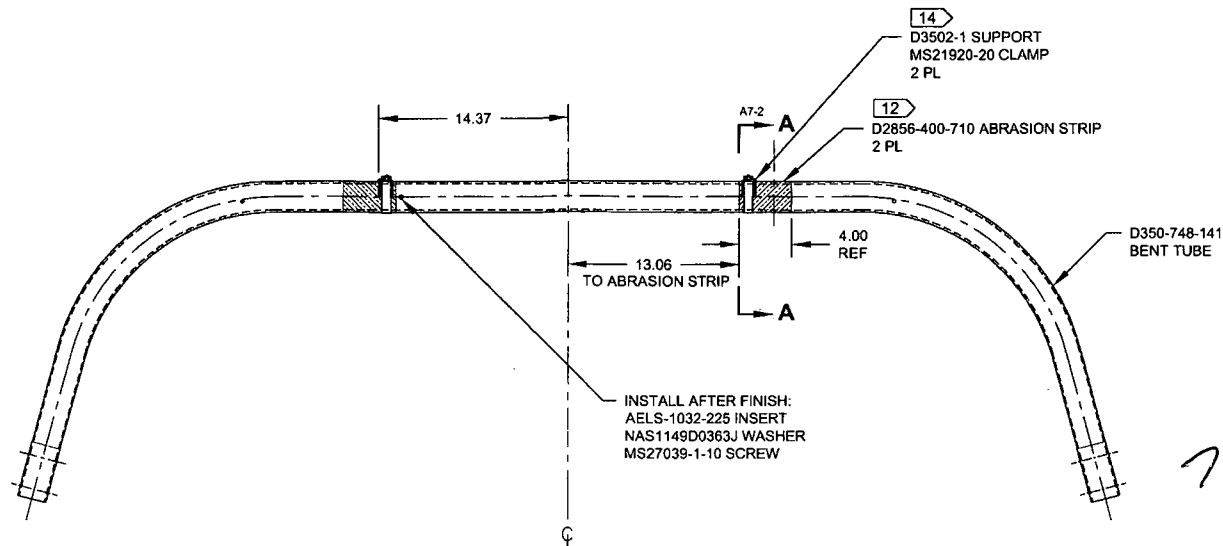
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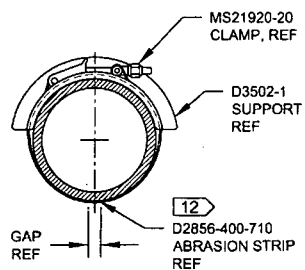
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**D350-748-141  
ASSEMBLY DETAIL**



**SECTION A-A** D4-2  
SCALE 4X

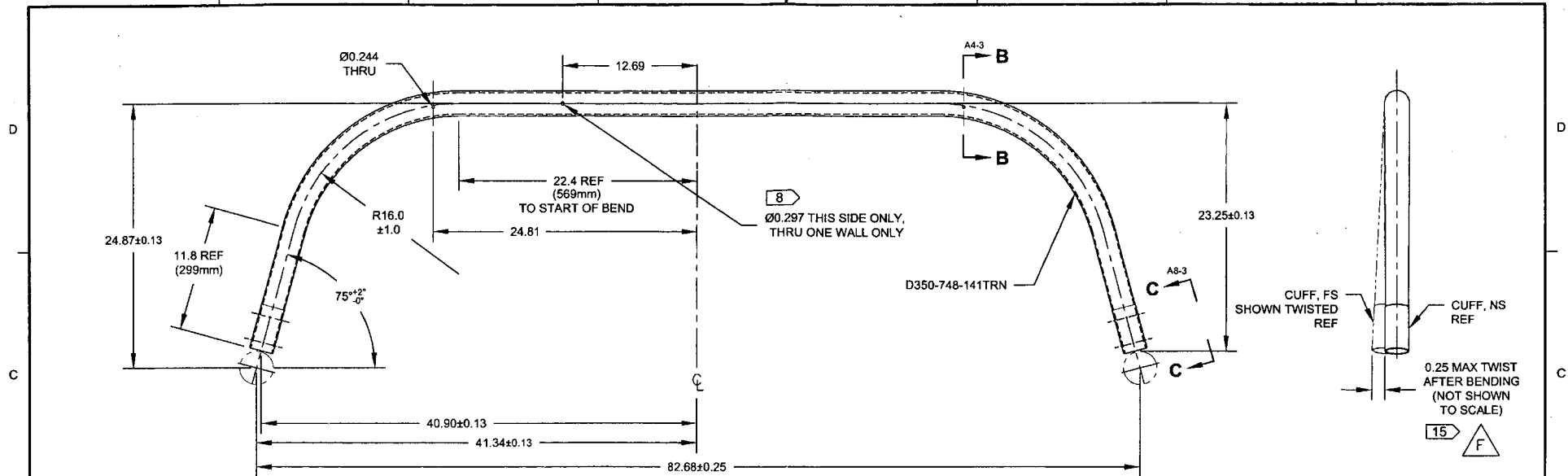
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DRAWN	92	HAWKESBURY, ONTARIO, CANADA	
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MFG. APPR.	92	D350-748-141	SHEET 2 OF 2
APPROVED	92	TITLE	SCALE
DE APPR.	92	CROSSTUBE (AS 350/355 HI FWD)	NTS
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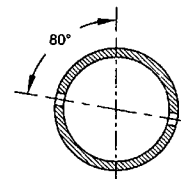
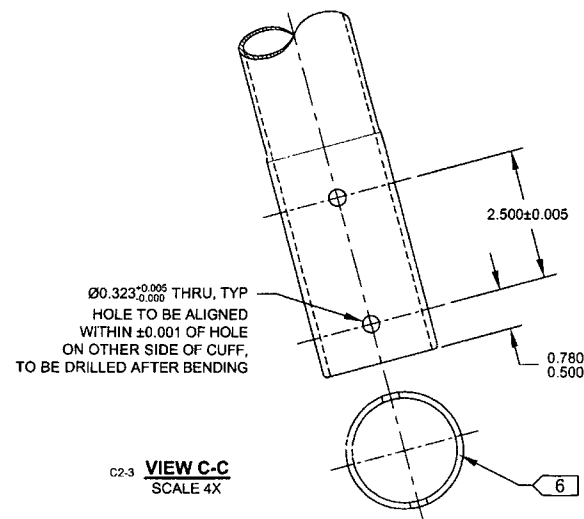


**D350-748-141**  
**BENDING AND DRILLING DETAIL** 10

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11.27.12

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MFG. APPR.	C	D350-748-141	SHEET 3 OF 4
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8 7 6 5 4 3 2 1









**VAC AERO**  
INTERNATIONAL INC.

**RELEASE NOTE**

GST No.: R105468102

OAK 133773-1



HEAD OFFICE  
1371 SPEERS ROAD, OAKVILLE, ONTARIO  
CANADA L6L 2X5  
TEL: (905) 827-4171 FAX: (905) 827-7489



2009 WYECROFT ROAD, UNIT B  
OAKVILLE, ONTARIO  
CANADA L6L 6J4  
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QUEBEC DIVISION  
7450 RUE VERITE STREET, ST. LAURENT, QUEBEC  
CANADA H4S 1C5  
TEL: (514) 334-4240 FAX: (514) 334-6269

09/22/2011

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1DAR01

BILL TO: DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

SHIP TO: DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

K6A 1K7

DATE SHIPPED	SHIP VIA	F.O.B.
09/22/2011		ORIGIN
CUSTOMER P/O No.	JOB No.	TERMS
P014727		NET 30 DAYS

PART No.	DESCRIPTION	UOM	QTY ORD	QTY SHPD	TEST RESULTS
D350-748	-141 CROSS TUBE	EA	12	12	
Process Specifications: Procedure: 4353 HEAT TREATED TO 180 KSI MIN. PER AMS 2759-1E 100% HARDNESS CHECKED AS PER ASTM E-18 40/45 HRC MATERIAL: 4130					
LINE# 70650,	1 PC	LINE# 72812,	1 PC		
LINE# 70652,	1 PC	LINE# 72813,	1 PC		
LINE# 72334,	1 PC	LINE# 72814,	1 PC		
LINE# 72335,	1 PC	LINE# 72815,	1 PC		
LINE# 72336,	1 PC	LINE# 72816,	1 PC		
LINE# 72337,	1 PC	LINE# 72817,	1 PC		

*Dulos bc*

100% HARDNESS TESTED  
44-12 PG  
44/45 HRC  
2288/11



I hereby certify that the material covered by this release note has been inspected and tested and conforms to all specifications relevant thereto in accordance with the conditions of the contract / or purchase order.

ON BEHALF OF VAC AERO INTERNATIONAL INC.



METAL TREATING INSTITUTE

Authorized Q.C. Inspector



Accredited  
**Nadcap**  
Heat Treating - Welding

VACUUM BRAZING - HEAT TREATING - SPECIAL PROCESSING - FURNACE EQUIPMENT  
TURBINE COMPONENT OVERHAUL - PLASMA AND OTHER COATINGS